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Safety, Reliability & Performance of the Ahead (ABM) Programmable Fuze System

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Ahead:

The AIR BURST Technology for Medium Calibre Ammunition

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Ahead (ABM) for Air Defense and Vehicle Armament

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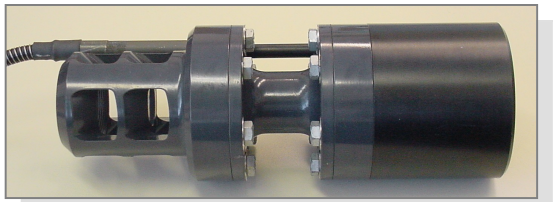
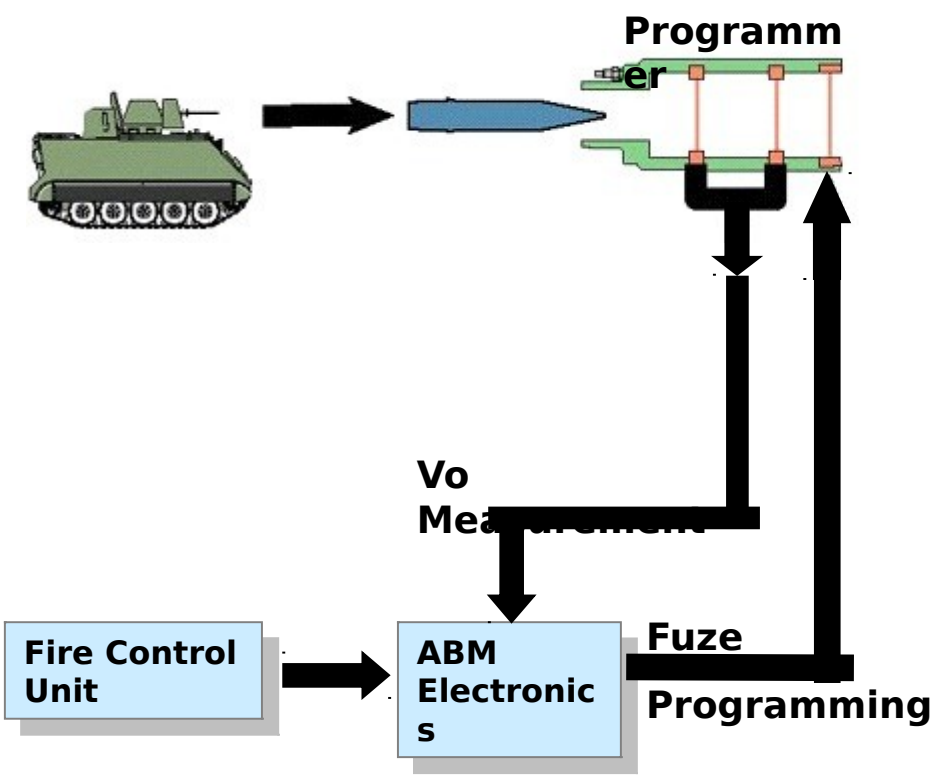
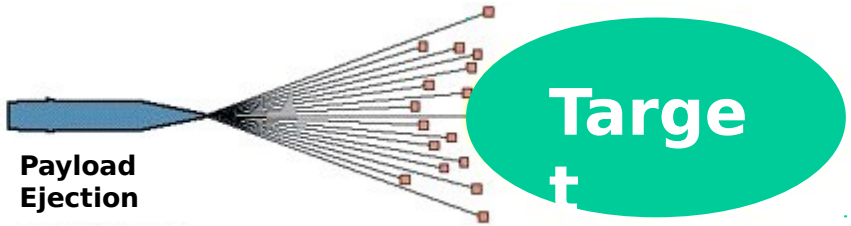
Application IFV:







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Ahead (ABM) KETF Projectile Concept Outline

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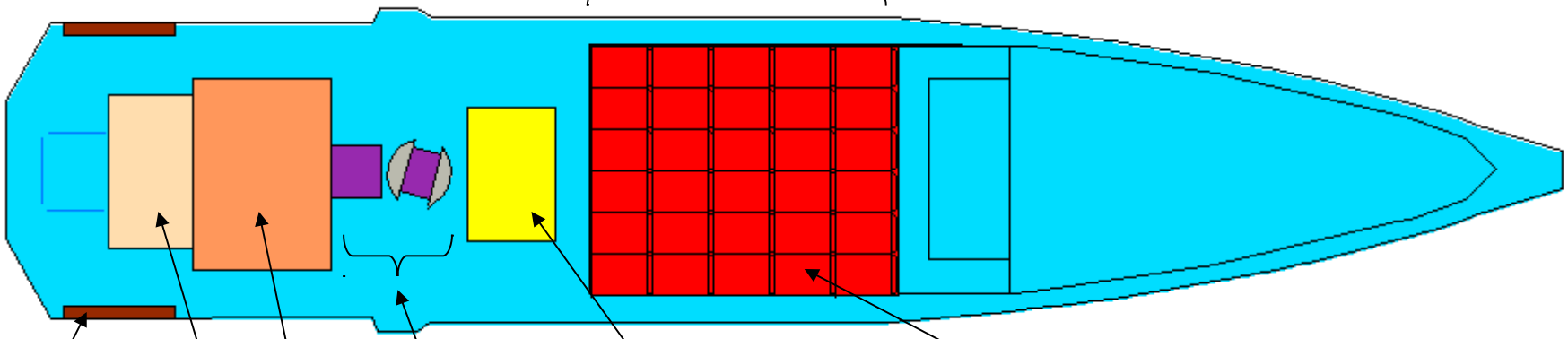

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Ahead (ABM) Fuze Module

Ignition System / Squib

Electronic Timer Module / ET 1-11

Set-Back Generator

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Safety Criteria for Ahead (ABM) KETF Fuze

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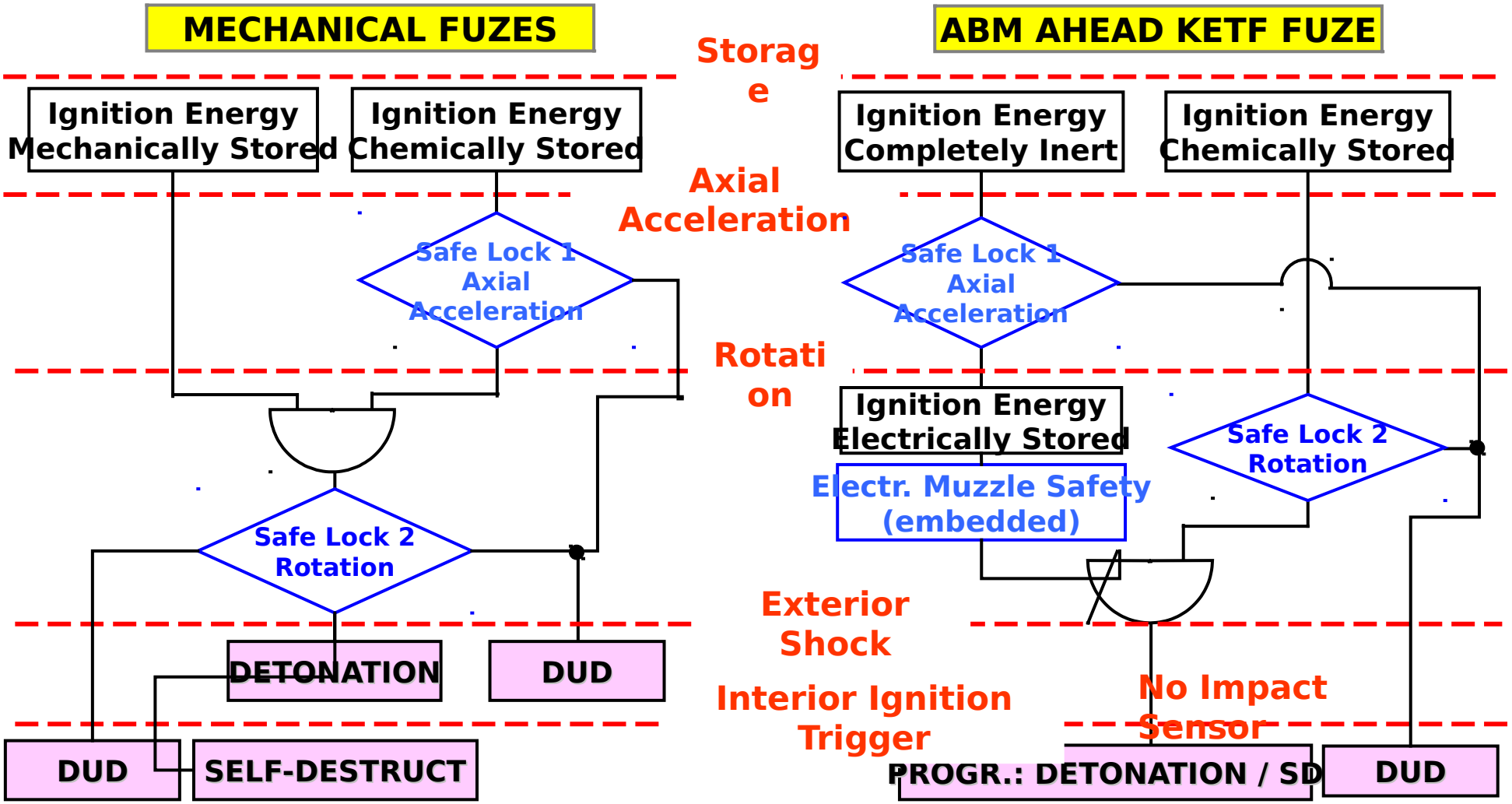

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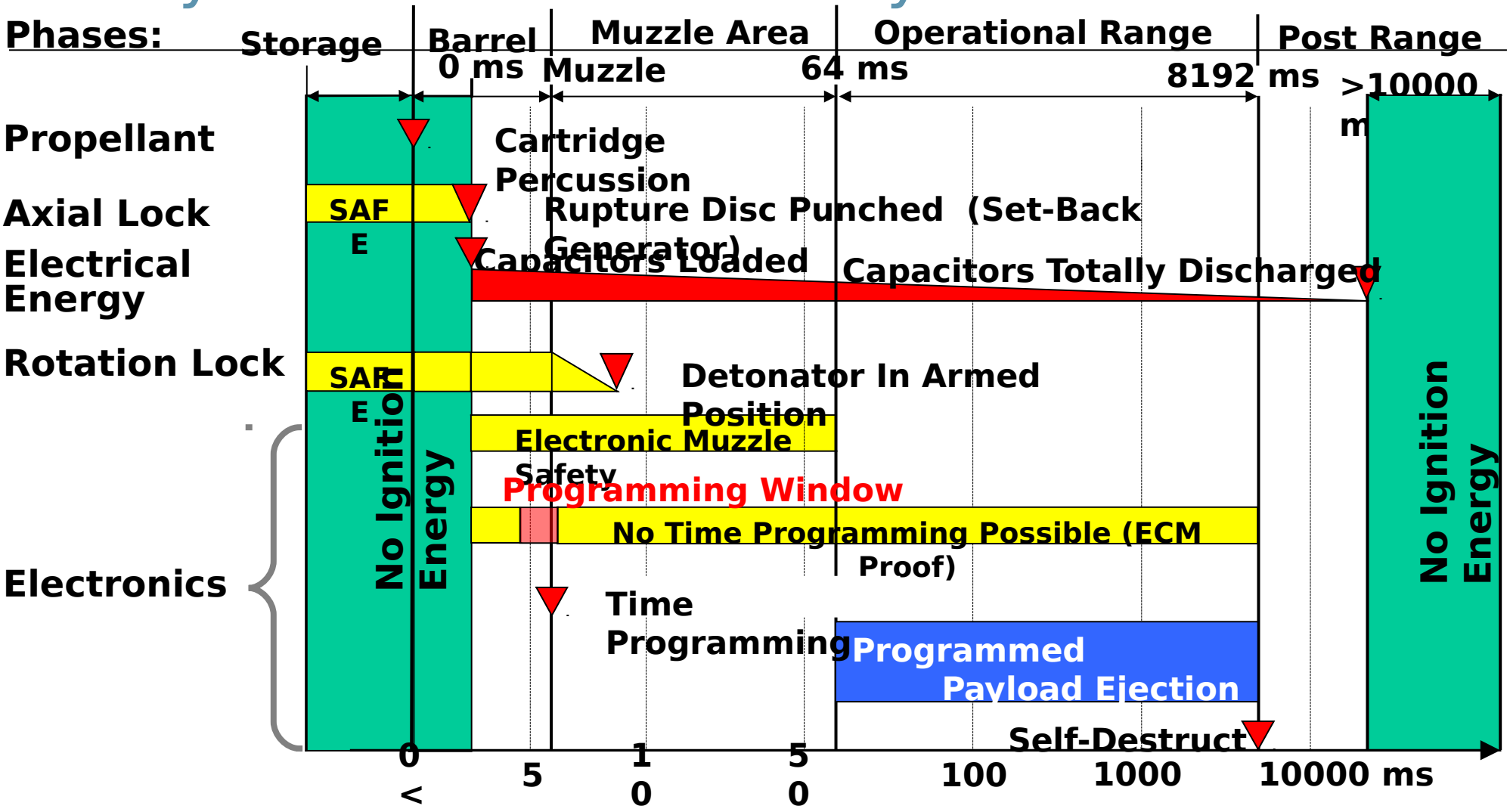
Ahead (ABM) KETF Fuze: Life Cycle Events - Summary



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Ahead (ABM) System Function Reliability

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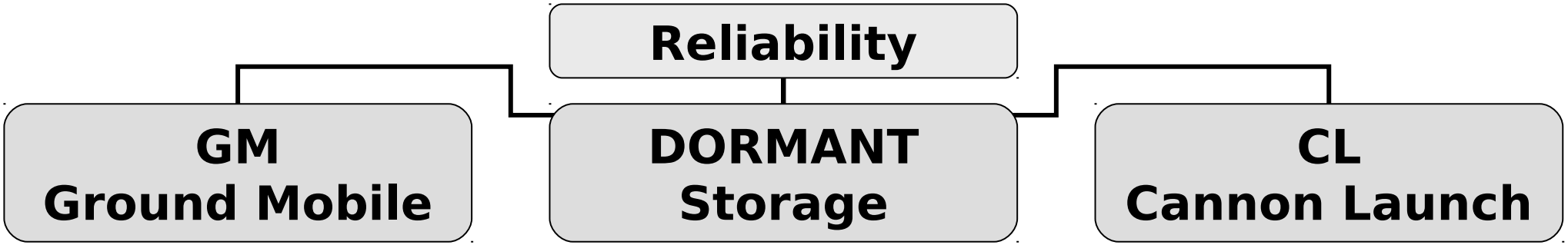
Theoretical Reliability Prediction according:

MIL Handbooks 217F2 & 338



Results of ABM System Ahead Reliability:

In Theory > 97%

In Practice > 97%

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35 mm Ahead (ABM) HETF Programmable Payload Delivery

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Precise Time Space Payload Delivery up to 5000 rd/min!

10th Rd:
300 m

1st Rd:
1200 m

„String of Pearls“ at 550 rd/min of 35mm Ahead-HETF Ammo

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Compensation of the Muzzle Velocity Variation

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Burst of 7 Rounds 35mm Ahead-HETF Ammo at 1.6 km Range

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30mm x 173 Ahead (ABM) KETF Subprojectile Payload: Layout & Footprint

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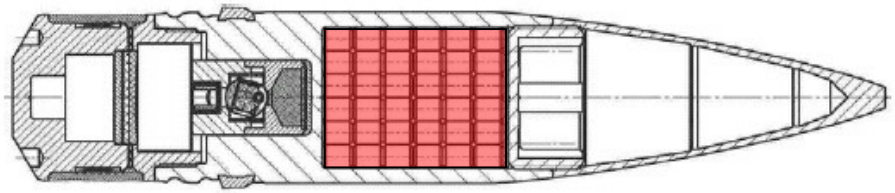
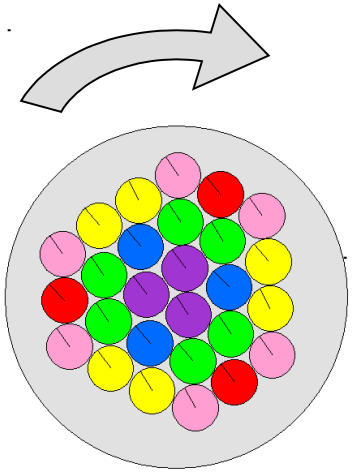
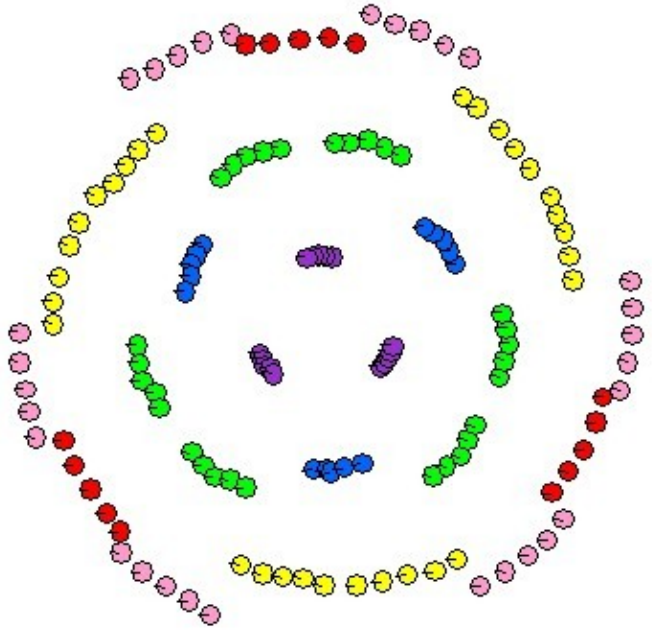
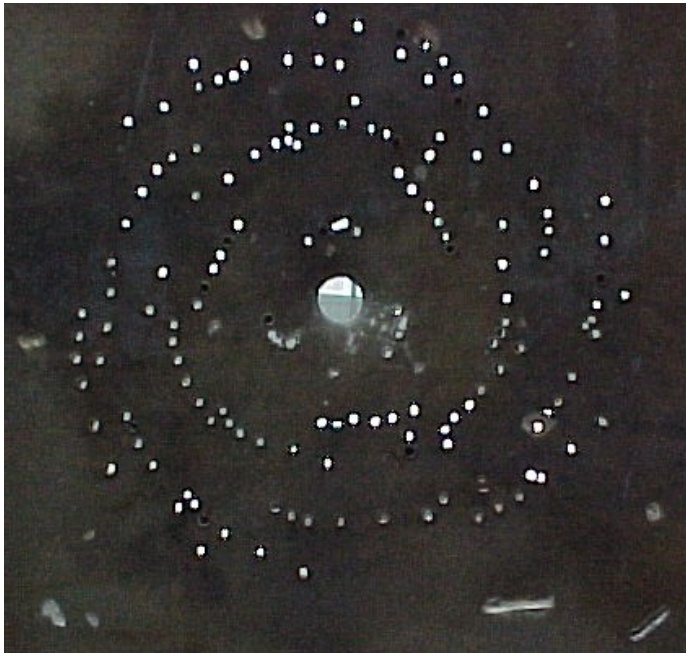




Layout of the 162 Subprojectiles SP (1.24 g each) 27 SP x 6 Layers



Version: 27 SP x 5 Layers (1.5 g) (Simulation after 500µs)



Payload-Footprint on 1 x 1 m Al -Plate after Ejection of the 162 SP (4 ms after ignition)

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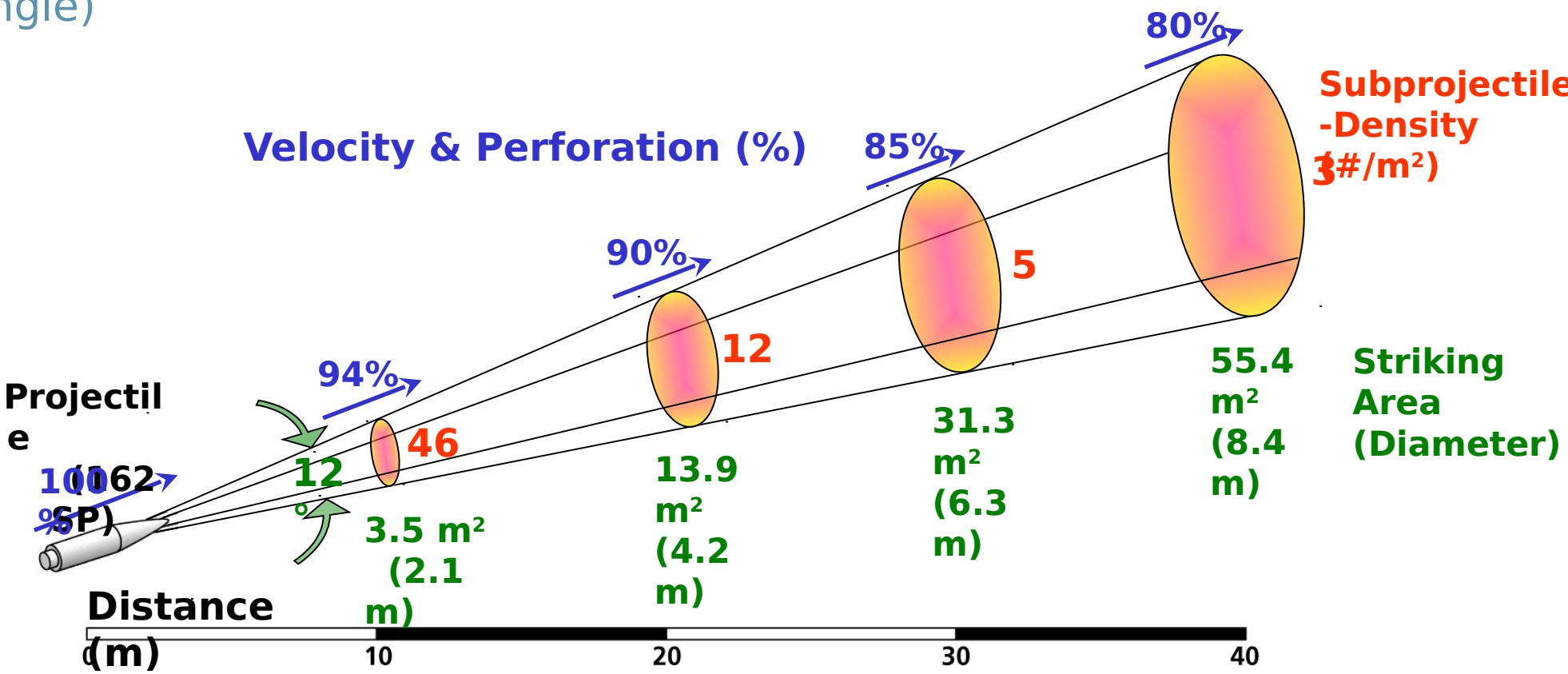
30mm x 173 Ahead (ABM) KETF Subprojectile Dynamic Parameter

Payload Ejection at 500 m Range (Cone of 12° Opening Angle)



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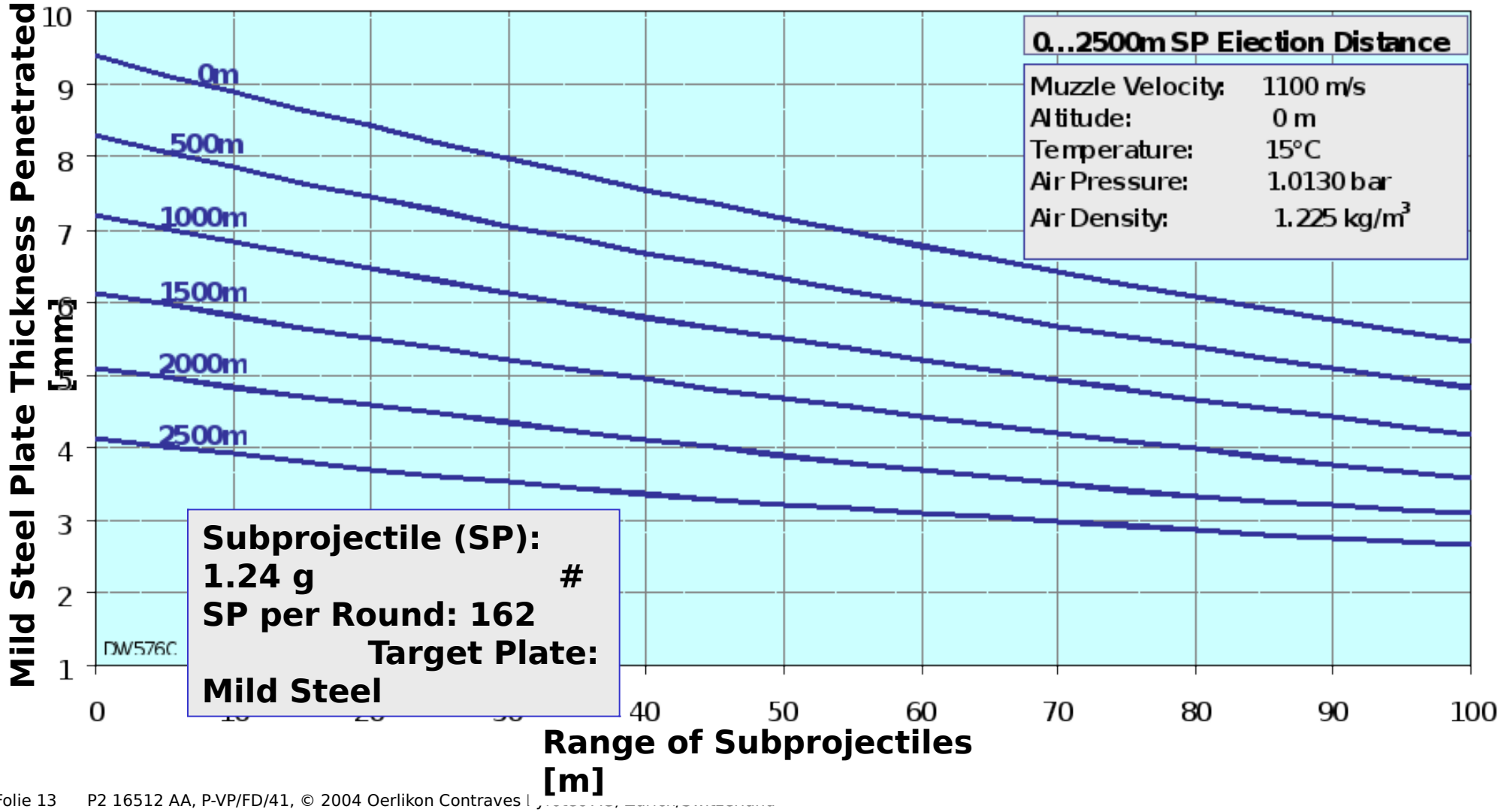
30mm x 173 Ahead (ABM) KETF Subprojectile Penetration Capability



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Burst
Effectiveness against ATGW-Bunker at 1 km

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Notice: ATGW: **A**nti-**T**ank **G**uided **W**eapon

Results: Numerous Full Perforations / 100% Damage (Demo: Dec.1999)

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30mm x 173 Ahead (ABM) KETF: 5 Round Burst against Squad of 7 - Target

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Target: Squad of 7 (Field: 2 x 38m)

The video shows a 5 round burst fired to the target field (firing rate: 200 rd/min).

Distance between rounds: 9 m

Multiple perforations in each of the 7 target plates (2mm Fe):

13 Perforations/m² on

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30mm x 173 Ahead (ABM) KETF against Urban Target (Unprogrammed Fuze)

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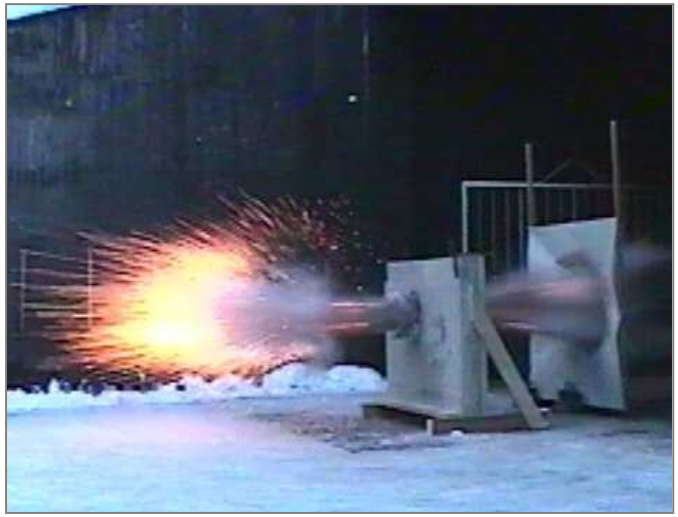

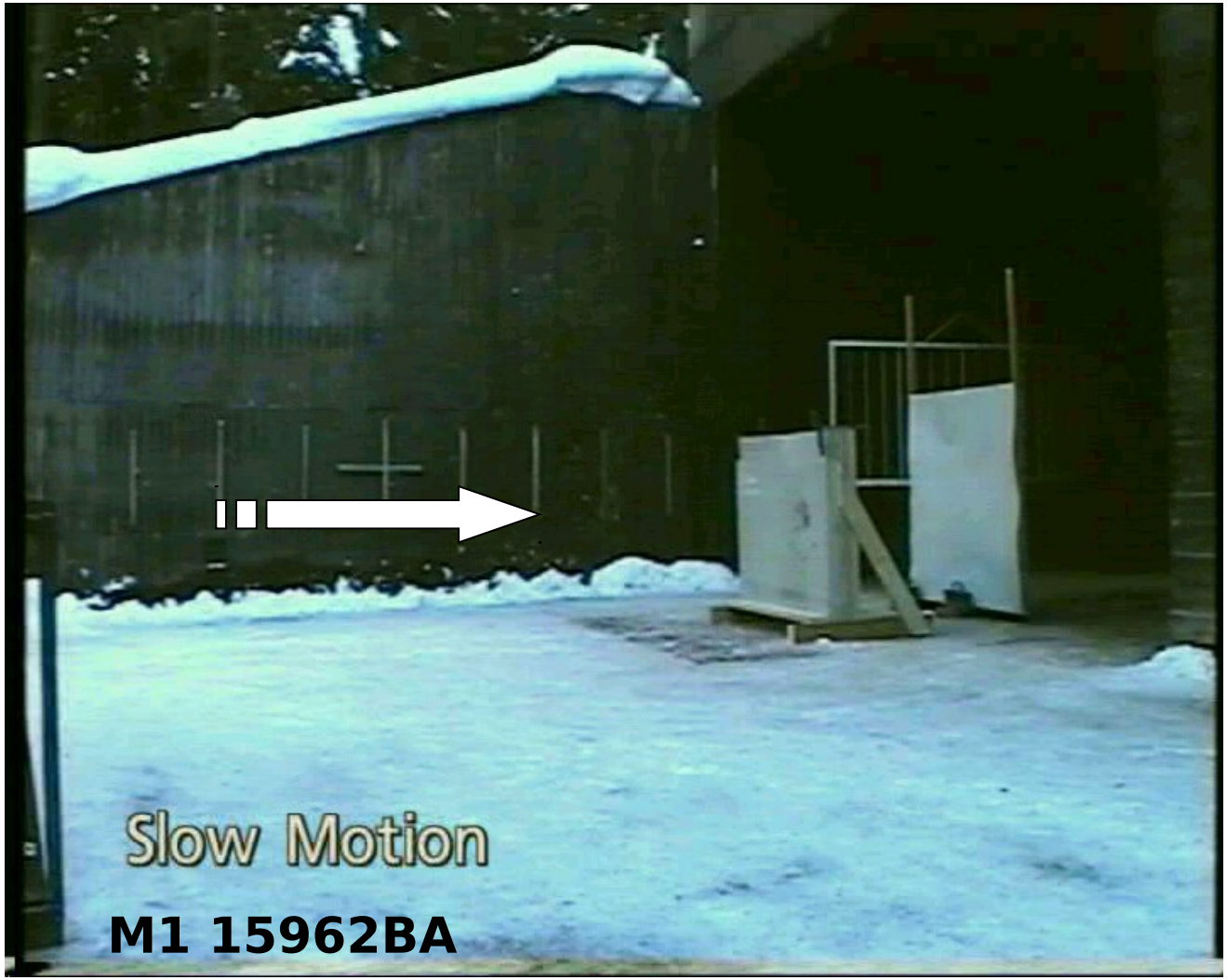

Target:
20 cm
Concrete Wall with double Steel-Structure Reinforced

Range: 500 m

Results:
Target Fully Penetrated

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35mm x 228 Ahead (ABM) KETF & HETF against ATGW-Bunker

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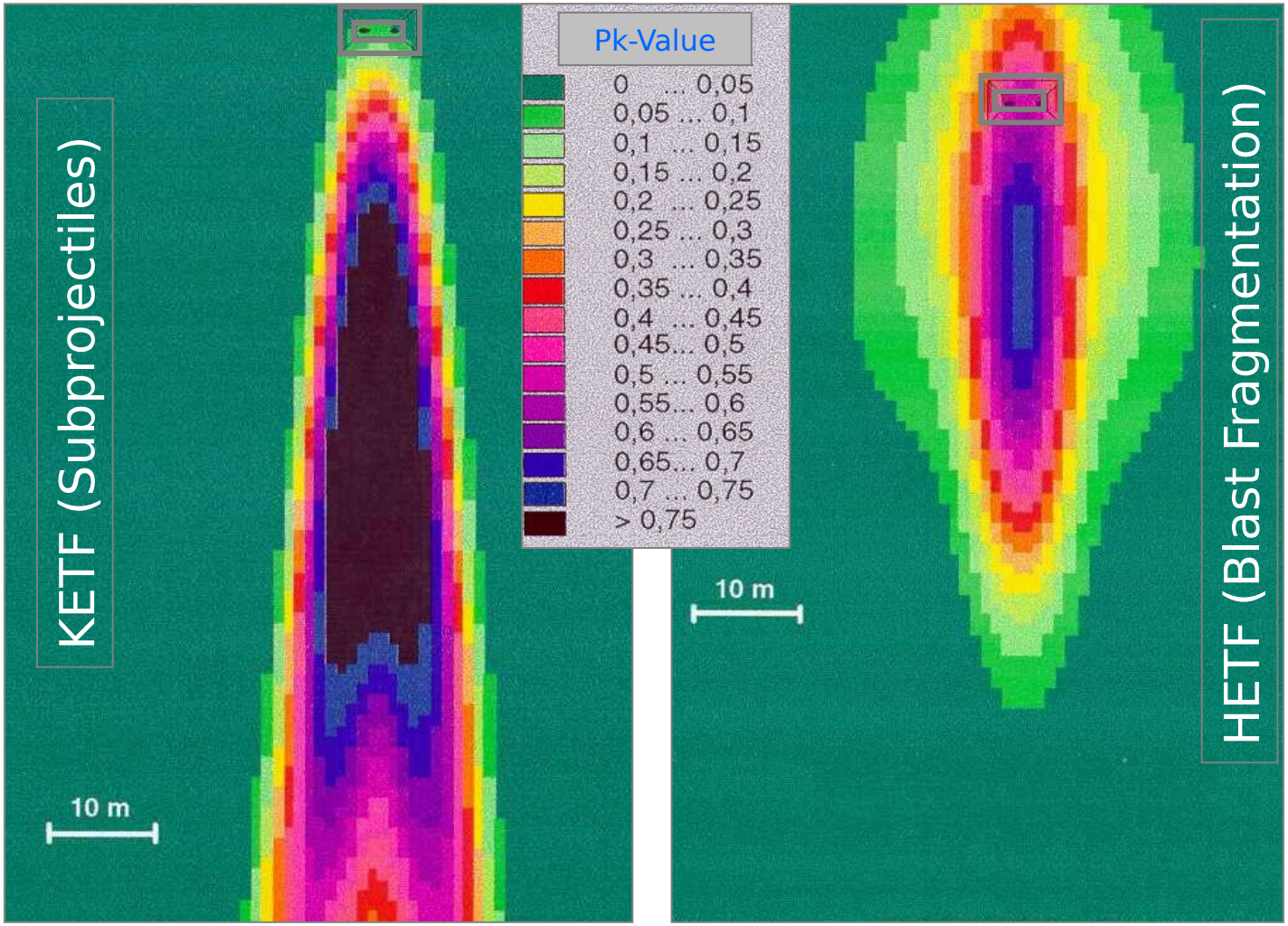
Lethality of a

3 Rd Burst against an ATGW Bunker at 1500 m



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Ahead (ABM) KETF: Ahead Technology Main Safety Features

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- Power Supply: Set Back Generator (Activation over 28‘000 g); i.e no Battery
- Full Gun Unload Safety
- Safe & Arm: Mechanical & Electronic
- Time Programming of less than 64 ms not accepted (Default: Self Destruct)
- Each Bit programmed with Double Pulse
- Completeness Check on 12 Bit Message (if negative: Self Destruct On!)
- If no fuze programming required or possible: automatically Self Destruct On
- No Impact Sensor in Fuze: firing through bushes & tree branches w/o burst
- Total HE content less than 0.6 g for 30mm

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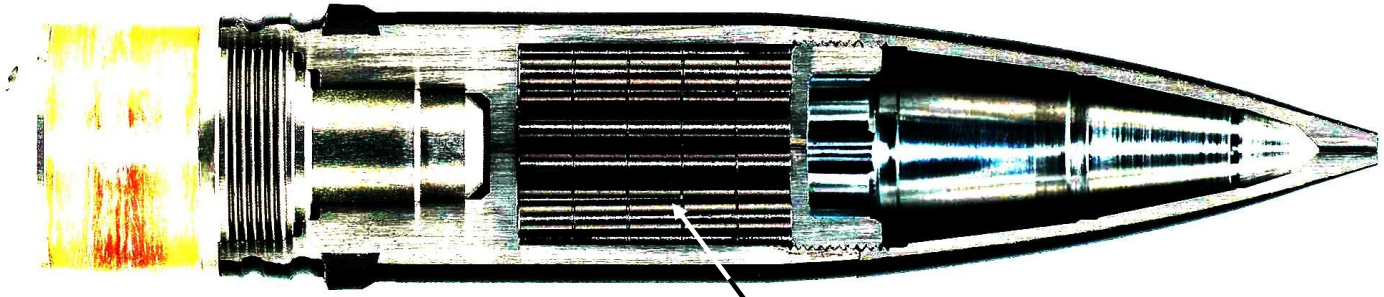
One Ahead (ABM) Fuze System - Two Different Warhead Configurations



30mm x 173

35mm x 228

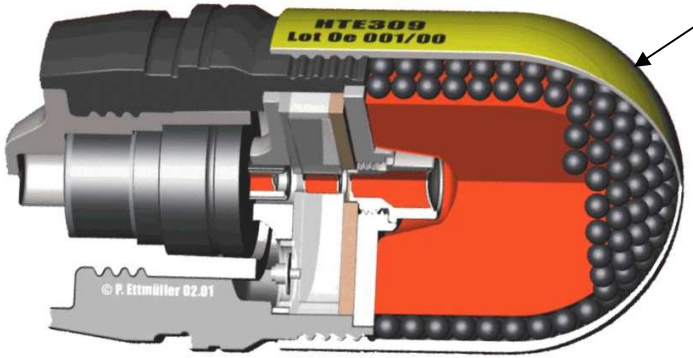
Subprojectile Warhead KETF

(Kinetic Energy Time Fuze)

Fuze

Blast Fragmentation Warhead HETF

(High Explosive Time Fuze)



Scale:

40mm x 53

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Ahead (ABM) HETF Basic Concept for 40mm x 53 Automatic Grenade Launcher AGL

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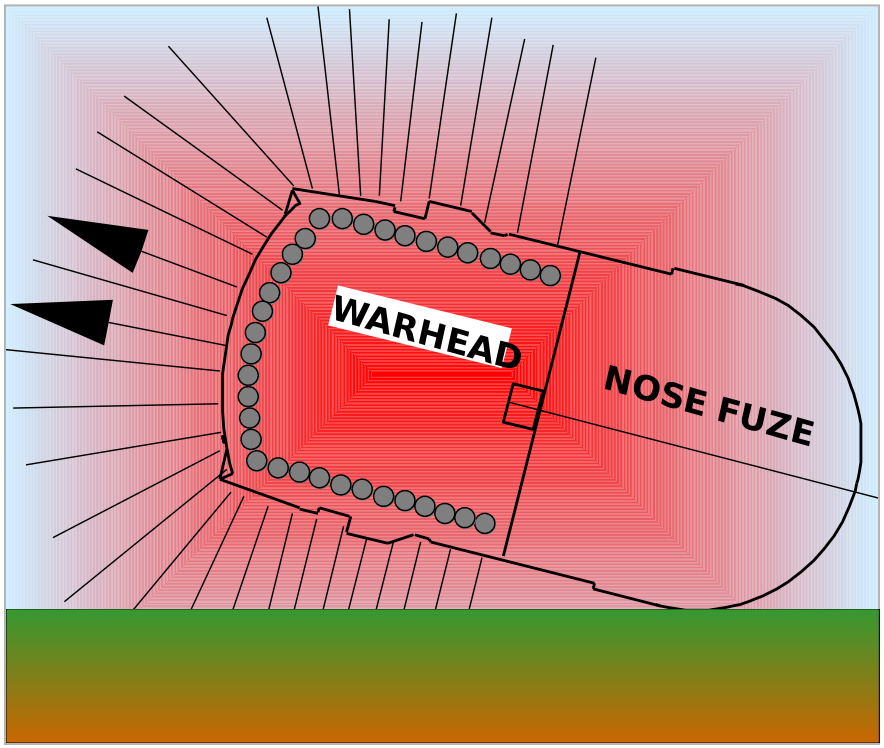
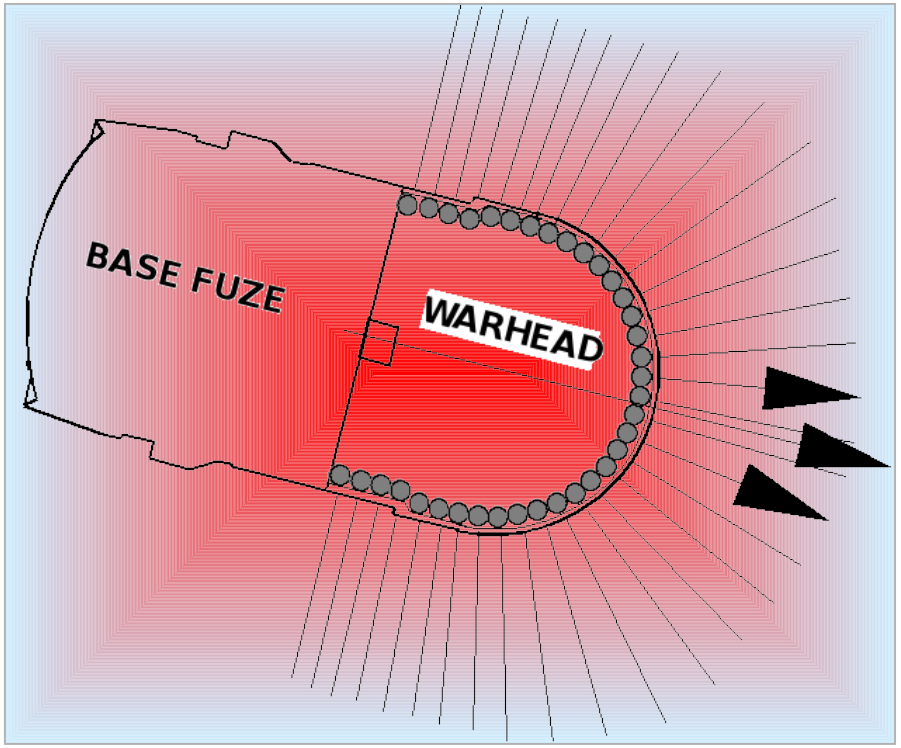


Conventional HE Round (PD-Fuze)



Optimum for Air Burst Munition

TARGET

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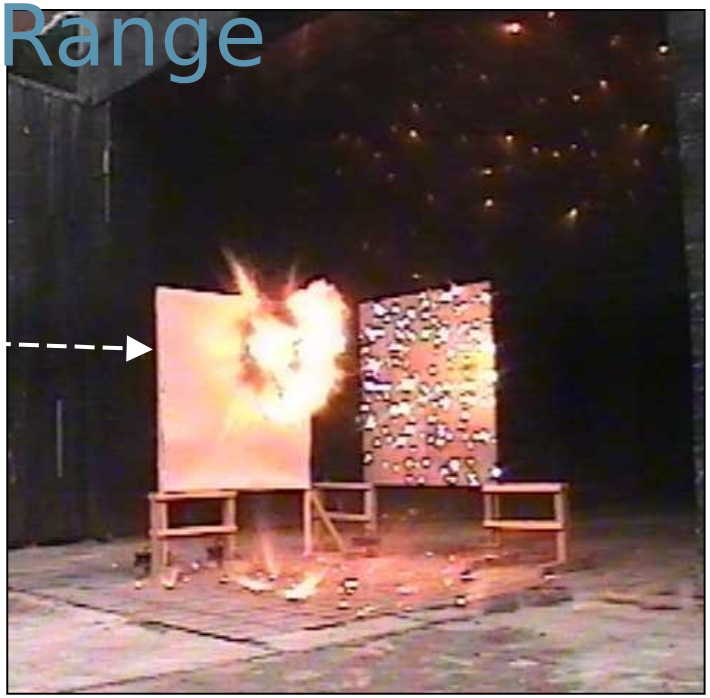
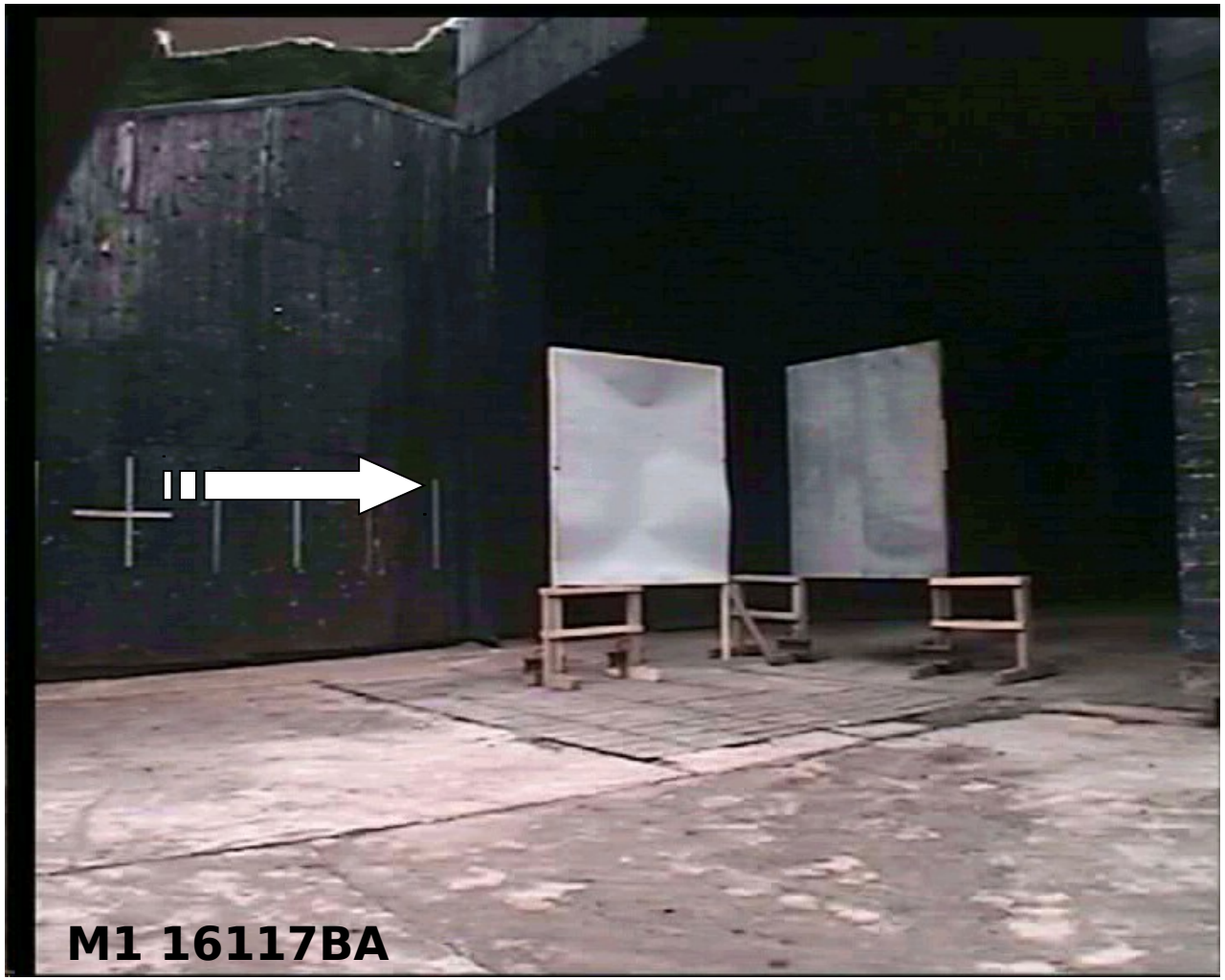
40 mm x 53 Ahead (ABM) HETF Firing Trials at 200 m & 1000 m Range





Remarks:

No fragments are flying backwards!

Firing Rate up to 570 rd/min (AGL-ST-Kinetics)

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Ahead (ABM) System Milestones

- 1973 8 bit - transmission demonstrated on a 20 mm shell at muzzle exit (1st "Ahead-like" programming)
- 1992 35 mm Ahead - Ammunition: technical presentation to international ammo experts /OCP- Test Center
- 1996 NATO qualification of the Ahead system (Canada)
- 1999 Demonstration of ABM 30 mm x 173 prototype
- 2000 Demonstration of ABM 40 mm x 53 prototype for AGL
- End 2003 - 35 mm Ahead ABM Systems fielded in 8 countries.

In evaluation / procurement in several others.

- 30 mm x 173/170 & 40 mm x 53 ABM in evaluation in several countries.

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35mm Ahead (ABM) KETF Detonation in Ammo Box

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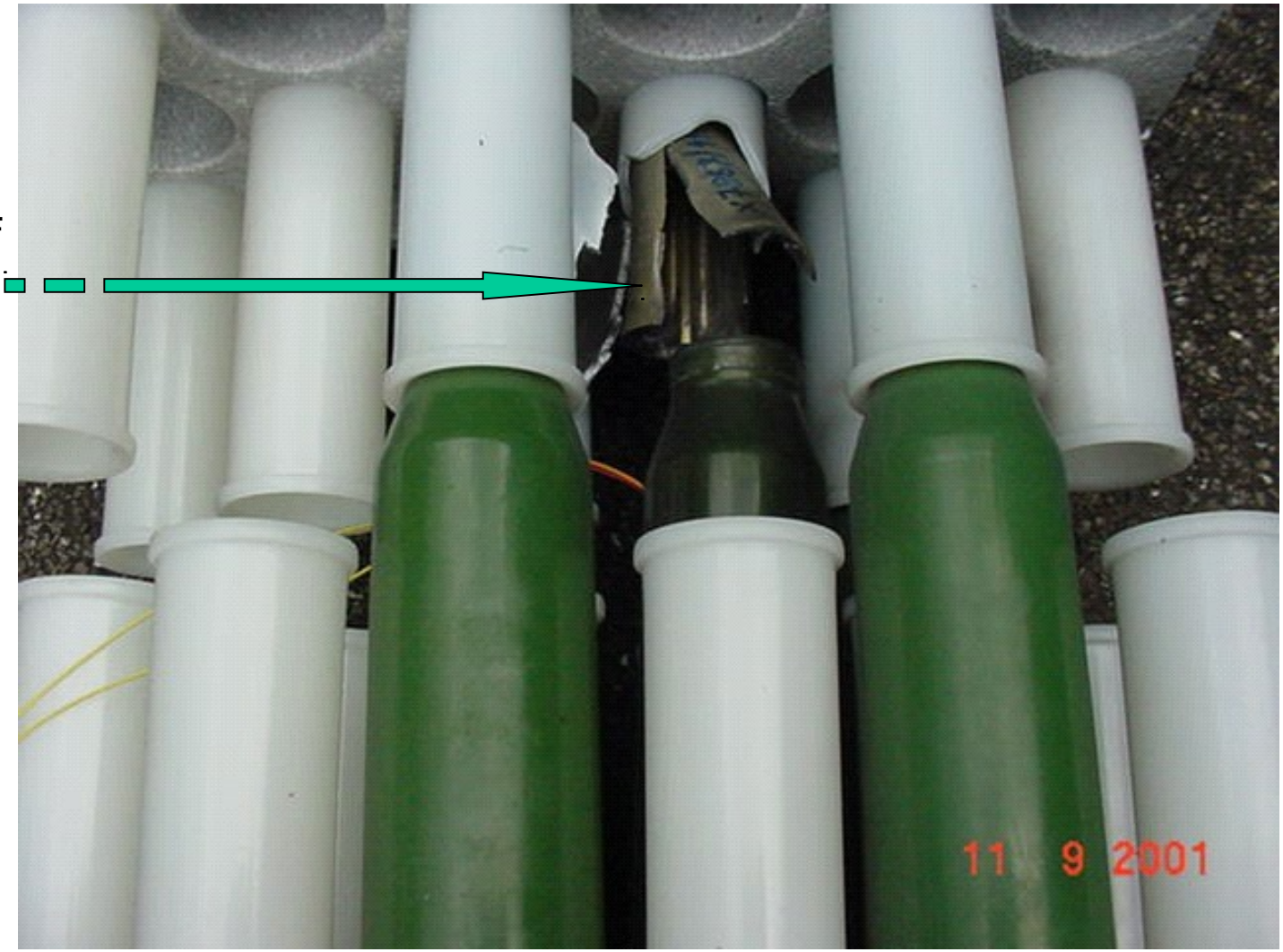
Ejection Charge (0.9 g HE) of One Round Detonated



Result:

no damage occurs to the other packed rounds and therefore no sympathetic detonation possible

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